does not, however, mean that they had the same survival. Applying a Cox regression on these patients, we had a *P* value of .435 and a hazard ratio of 1.271 (95% confidence interval 0.696-2.322), which means that patients with intracapsular involved lymph nodes have a 27% higher risk of dying than did those with pN0 disease. This hazard ratio is not extreme relative to the hazard ratio of 3.37 in patients with lymph node involvement. There were sufficient patients at risk in each time interval: 33, 29, 24, 16, 15, and 12 for the pN0 group and 60, 53, 36, 25, 17, and 14 for the intracapsular group at 0, 1, 2, 3, 4, and 5 years, respectively.

The difference we found regarding the mean and median number of involved lymph nodes (3.68 and 3.0 for intracapsular vs 7.96 and 6.0 for extracapsular) was mainly caused by some extreme values in the extracapsular group, which could indicate that extracapsular involvement points to more advanced disease. However, we checked the interaction between lymph node status and number of involved lymph nodes by analysis of variance and ruled out significant interaction between these variables, so both can be considered as independent effects.

As to the subgroup of patients with exactly one intracapsular versus one extracapsular involved lymph node, we agree that a type II error is possible because of the small group. The reason we included this graph was merely to demonstrate the effect of intracapsular versus extracapsular involvement after having neutralized the effect of number of positive lymph nodes. Because of the small number of patients, we couldn't conclude that patients with one intracapsular lymph node have a better survival than patients with no involved lymph nodes. This graph merely shows the detrimental effect of extracapsular involvement on survival.

Again, we would like to highlight the importance of extracapsular involvement, which seems far greater than the effect of number of involved lymph nodes. As our model indicates, the effect of extracapsular involvement (237%) is much greater than the cumulative effect of, for example, 12 positive nodes ($12 \times 8.6\% = 103.2\%$). For this reason we believe that in addition to the number of involved lymph nodes, lymph node status (intracapsular vs extracapsular) should be routinely incorporated in every pathology report. If our results are confirmed by other centers, then perhaps extracapsular involvement should be incorporated in the TNM staging system as well, unless indeed biologic and molecular biological markers, the Holy Grail of prognostic indicators, are able to replace the actual routine staging.

In conclusion, if you see one, ask your pathologist to look at the capsula.

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References

1. DeMeester SR. Lymph node involvement in esophageal adenocarcinoma: if you see one, have you seen them all? *J Thorac Cardiovasc Surg*. 2003;126:947-9.
2. Lerut T, Coosemans W, Decker G, De Leyn P, Ectors N, Fieuws S, et al. Extracapsular lymph node involvement is a negative prognostic factor in T3 adenocarcinoma of the distal esophagus and gastroesophageal junction. *J Thorac Cardiovasc Surg*. 2003;126:1121-8.

doi:10.1016/j.jtcvs.2004.01.027

Skeletonized bilateral internal thoracic arteries in patients with diabetes: Additional advantages and concerns

To the Editor:

The article by Peterson and colleagues[1] published in the November 2003 issue of the *Journal* is clearly an important study demonstrating the beneficial impact of using skeletonized bilateral internal thoracic artery (ITA) grafts on the incidence of sternal wound infection in patients with diabetes. In terms of morbidity, sternal dehiscence as a consequence of sternal devascularization is the most worrying potential complication of bilateral ITA grafts, particularly in patients with diabetes. Patients with diabetes are those with potentially most to gain from bilateral ITA grafts, because they often have more severe, diffuse, and distal disease. Appropriate patient selection and modification of the technique for harvesting the ITA can significantly reduce the risk of impaired wound healing in these patients. Harvesting the ITA with the traditional pedicled technique also involves harvest of surrounding parietal pleura, venae comitantes, muscle, and fascia, leaving a completely denuded and devascularized strip of chest wall. Harvesting only the ITA itself ("skeletonizing" technique) preserves intercostal collateral vessels and some sternal blood supply. Not only does the skeletonization technique result in superior sternal blood flow preservation[2] and reduce risk of wound healing in all patients[3] and those with diabetes in particular,[4,5] it also offers several additional advantages. These include aiding judgment of graft length, provision of extra length (an important consideration if the ITA is to be used for more than a single graft, as a sequential graft), allowing thorough visual inspection to identify spastic or damaged areas that could otherwise be obscured by perivascular fat, facilitating sequential anastomoses and composite arterial grafting (because the venae comitantes, perivascular fat, and areolar tissue do not obscure the anastomosis), and minimizing the risks of kinks or twists in the conduit.

There are, however, several points of caution to be emphasized with the skeletonization technique. It is technically more demanding than pedicle harvesting, and careful and meticulous dissection is required. Skeletonization takes longer than does the pedicle technique and has a definite learning curve. Small arterial branches can be inadvertently avulsed by excessive downward retraction, resulting in injury to the artery and compromising long-term patency. Finally, skeletonization probably induces a greater degree of spasm.

Perhaps what is missing from this particular study is the incidence of ITA injury sustained during skeletonization and the fate of any injured ITAs. Also, it would be interesting to know about the authors' experience of ITA spasm resulting from skeletonization and any measures they took to deal with it.

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References

1. Peterson MD, Borger MA, Rao V, Peniston CM, Feindel CM. Skeletonization of bilateral internal thoracic artery grafts lowers the risk of sternal infection in patients with diabe-

tes. *J Thorac Cardiovasc Surg*. 2003;126: 1314-9.
2. Cohen AJ, Lockman J, Lorberboym M, Bder O, Cohen N, Medalion B, et al. Assessment of sternal vascularity with single photon emission computed tomography after harvesting of the internal thoracic artery. *J Thorac Cardiovasc Surg*. 1999;118: 496-502.
3. Calafiore AM, Vitolla G, Iaco AL, Fino C, Di Giammarco G, Marchesani F, et al. Bilateral internal mammary artery grafting: midterm results of pedicled versus skeletonized conduits. *Ann Thorac Surg*. 1999;67:1637-42.
4. Sofer D, Gurevitch J, Shapira I, Paz Y, Matsa M, Kramer A, et al. Sternal wound infections in patients after coronary artery bypass grafting using bilateral skeletonized internal mammary arteries. *Ann Surg*. 1999;229:585-90.
5. Matsa M, Paz Y, Gurevitch J, Shapira I, Kramer A, Pevny D, et al. Bilateral skeletonized internal thoracic artery grafts in patients with diabetes mellitus. *J Thorac Cardiovasc Surg*. 2001;121:668-74.

doi:10.1016/j.jtcvs.2003.12.044

Reply to the Editor:

We thank Dr Raja for his supportive comments and we agree with the additional advantages offered by skeletonizing the internal thoracic artery (ITA) for grafting stated in his letter. In particular, the additional length gained by skeletonization is extremely helpful when the right ITA is used as an in situ graft to obtuse marginal branches of the circumflex coronary artery.[1]

Dr Raja correctly notes that skeletonization of ITAs requires more technical expertise and time than does conventional pedicled harvesting. Although the total operative times were similar for the skeletonized and conventional groups in our study,[2] skeletonization may add 10 to 20 minutes to the ITA harvesting time. The surgeons in our study felt proficient with skeletonization after approximately 20 ITA harvests. Injury to the ITA during this learning phase is a concern, but we did not record the frequency of ITA injury in our database. If an ITA graft is injured during harvesting, we can occasionally utilize the undamaged segment as a free graft. The surgeons who routinely perform skeletonization at our institution report a very low (<1%) incidence of ITA injury. Unfortunately, most studies in the literature do not report the incidence of injury to the ITA graft during skeletonization; however, Nishida and colleagues[3] reported an incidence of 0.7%.

Dr Raja also raises the concern that manipulation of the ITA graft during skeletonization may contribute to an increased propensity toward graft spasm. Spasm of the ITA graft has been reported in the literature, and some institutions inject the ITA with papaverine to prevent spasm. However, intraluminal injection of vasodilating agents can itself lead to graft injury by pressurizing the artery, resulting in endothelial damage or dissection. Instead, we prefer to bathe skeletonized ITAs with topical papaverine. Although we do not actively record the incidence of postoperative ITA spasm in our institution, we do know that it is uncommon.

We believe that meticulous ITA skeletonization offers many advantages relative to pedicled harvesting, with an acceptably low risk of complications.

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References

1. Bonacchi M, Prifti E, Battaglia F, Frati G, Sani G, Popoff G. In situ retrocaval skeletonized right internal thoracic artery anastomosed to the circumflex system via transverse sinus: technical aspects and postoperative outcome. *J Thorac Cardiovasc Surg*. 2003;126:1302-13.
2. Peterson MD, Borger MA, Rao V, Peniston CM, Feindel CM. Skeletonization of bilateral internal thoracic artery grafts lowers the risk of sternal infection in patients with diabetes. *J Thorac Cardiovasc Surg*. 2003;126:1314-9.
3. Nishida H, Tomizawa Y, Endo M, Koyanagi H, Kasanuki H. Coronary artery bypass with only in situ bilateral internal thoracic arteries and right gastroepiploic artery. *Circulation*. 2001;104(12 Suppl 1):I76-80.

doi:10.1016/j.jtcvs.2004.01.028

A lost opportunity

To the Editor:

In the article "Neurodevelopmental Status at Eight Years in Children with Dextrotransposition of the Great Arteries: The Boston Circulatory Arrest Trial," Bellinger and colleagues[1] presented a sophisticated prospective randomized study, with an extensive data collection and analysis. However, they limited their investigations to "the two major methods of vital organ support, total circulatory arrest and low-flow cardiopulmonary bypass." I respectfully disagree with Bellinger and colleagues' decision, because they wasted a good opportunity by using a tremendous amount of effort and expertise to evaluate two methods already proven to provide suboptimal results. In my opinion, comparing total circulatory arrest and low-flow cardiopulmonary bypass is like comparing two different brands of cigarettes to evaluate whether one is less dangerous than the other.

There are already too many experimental and clinical studies reported in the literature on how to reduce the negative effects of hypothermia or flow reduction: metabolic derangement; endothelial lesions; and vascular, myocardial, neurologic, hematologic, and respiratory impairment.[2,3] Instead of investing their extraordinary resources in this type of research, Bellinger and colleagues could explore an alternative method of cardiopulmonary bypass, even if they do not consider it to be one of the "two major methods of vital organ support": normothermic high-flow cardiopulmonary bypass.[3,4] This method has already been supported by clinical experience with more than 1600 cases of surgery for congenital heart disease, including the arterial switch operation for neonates with transposition of the great arteries.[4]

The readers involved with the surgical treatment of children with congenital heart disease should be aware that we as surgeons are not obliged to choose between suboptimal methods of cardiopulmonary bypass, much as we are not obliged to choose among different brands of cigarettes if we are not smokers. There is the proven possibility of performing cardiopulmonary perfusion much closer to the physiologic state,[4] and research units like the one of this study could use their resources to compare the "two major methods of vital organ support" with a more physiologically compatible method.

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